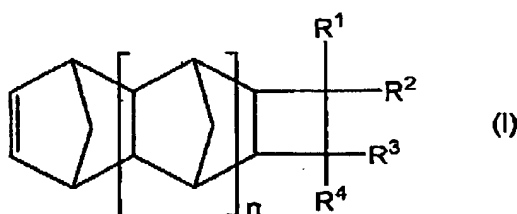


Amendments to Claims

1. (Currently amended) A polymer copolymer comprising a repeat unit derived from

(a) at least one repeat unit derived from an ethylenically unsaturated compound having at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom; and

(b) at least one repeat unit derived from an ethylenically unsaturated compound having the structure:



wherein n is 0, 1, or 2;

R¹, R², R³ and R⁴ are independently H, OR⁵, halogen, alkyl or alkoxy of 1 to 10 carbon atoms, optionally substituted by halogen or ether oxygens, Y, C(R_f)(R_f')OR⁵, R⁶Y or OR⁶Y;

Y is COZ or SO₂Z;

R⁵ is hydrogen or an acid-labile protecting group;

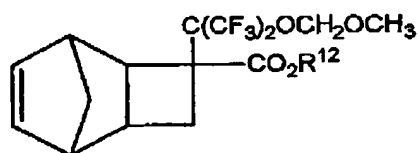
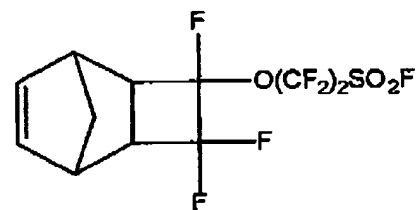
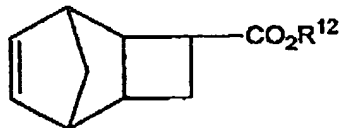
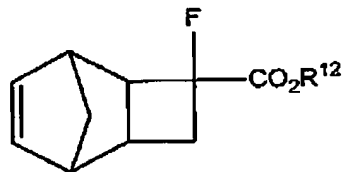
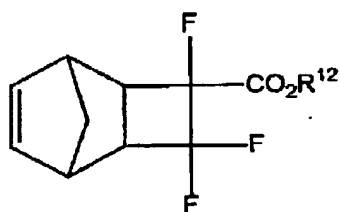
R_f and R_f' are the same or different fluoroalkyl groups of 1 to 10 carbon atoms or taken together are (CF₂)_m where m is 2 to 10;

R⁶ is an alkylene group of 1 to 20 carbon atoms, optionally substituted by halogen or ether oxygen;

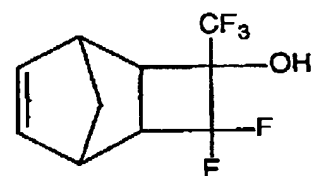
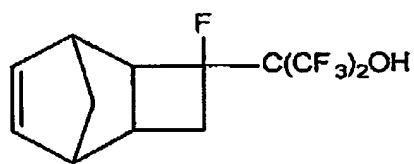
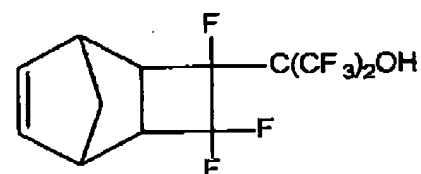
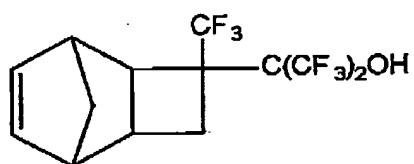
Z is OH, halogen, or OR⁷; and

R⁷ is an alkyl group of 1 to 20 carbon atoms, with the proviso that at least one of R¹, R², R³ and R⁴ is Y, OR⁵, C(R_f)(R_f')OR⁵, R⁶Y or OR⁶Y, and the proviso that if R¹ (or R³) is OH, R² (or R⁴) is not OH or halogen.

2. (Currently amended) The polymer copolymer of Claim 1, wherein the compound having structure (I) is selected from the group consisting of:



5



wherein R^{12} is an alkyl group of 1 to 20 carbon atoms.

10

3. (Currently amended) The polymer copolymer of Claim 1, wherein the at least one ethylenically unsaturated compound having at

least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom is a fluoroolefin which comprises 2 to 20 carbon atoms.

4. (Currently amended) The polymer copolymer of Claim 3,
5 wherein the fluoroolefin is selected from the group consisting of
tetrafluoroethylene; hexafluoropropylene; chlorotrifluoroethylene;
vinylidene fluoride; vinyl fluoride; perfluoro-(2,2-dimethyl-1,3-dioxole);
perfluoro-(2-methylene-4-methyl-1,3-dioxolane); $\text{CF}_2=\text{CFO}(\text{CF}_2)_t\text{CF}=\text{CF}_2$,
wherein t is 1 or 2; and $\text{R}_f''\text{OCF}=\text{CF}_2$ wherein R_f'' is a saturated fluoroalkyl
10 group of from 1 to 10 carbon atoms.

5. (Currently amended) The polymer copolymer of Claim 4,
wherein the fluoroolefin is tetrafluoroethylene.

15 6. (Currently amended) The polymer copolymer of Claim 1, further
comprising a unit containing a fluoroalcohol group or a protected
fluoroalcohol group.

7. (Currently amended) The polymer copolymer of Claim 6,
20 wherein the fluoroalcohol group or the protected fluoroalcohol group is
derived from at least one ethylenically unsaturated compound containing a
fluoroalcohol group having the structure:



25

wherein R_f and R_f' are the same or different fluoroalkyl groups of from 1 to
10 carbon atoms or taken together are $(\text{CF}_2)_m$ wherein m is 2 to 10.

8. (Currently amended) The polymer copolymer of Claim 7,
30 wherein R_f and R_f' are perfluoroalkyl groups.

9. (Currently amended) The polymer copolymer of Claim 1, further
comprising a unit containing a fluoroalcohol group having the structure:



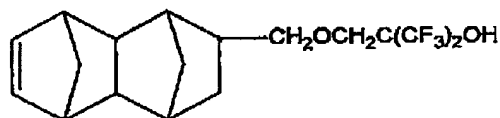
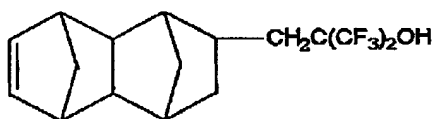
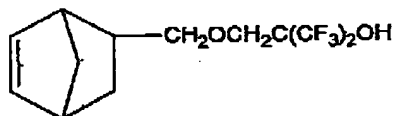
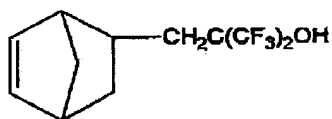
- wherein R_f and R_f' are the same or different fluoroalkyl groups
 5 of from 1 to 10 carbon atoms or taken together are $(CF_2)_m$ wherein m is 2
 to 10; and X is an element from Group VA or Group VIA of the Periodic
 Table of the Elements.

10. (Currently amended) The ~~polymer~~ copolymer of Claim 9,
 10 wherein X is selected from the group consisting of oxygen, sulfur, nitrogen
 and phosphorous.

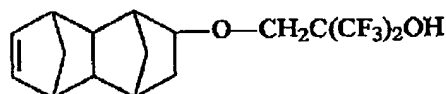
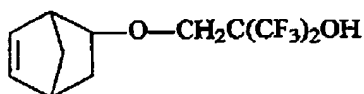
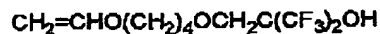
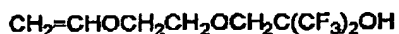
11. (Currently amended) The ~~polymer~~ copolymer of Claim 10,
 wherein X is oxygen.

15

12. (Currently amended) The ~~polymer~~ copolymer of Claim 7,
 wherein fluoroalcohol group or the protected fluoroalcohol group is derived
 from a monomer selected from the group consisting of:

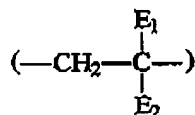


20



13. (Currently amended) The ~~polymer~~ copolymer of Claim 1 further comprising at least one acid-containing or protected acid-containing group of structural unit:

5



wherein E₁ is H or C₁-C₁₂ alkyl; E₂ is CO₂E₃, SO₃E, or other acidic group; and E and E₃ are independently selected from the group of H,
10 unsubstituted C₁-C₁₂ alkyl, and heteroatom substituted C₁-C₁₂ alkyl.

14. (Currently amended) The ~~polymer~~ copolymer of Claim 13, wherein the heteroatom is selected from the group consisting of oxygen, nitrogen, sulfur, halogen and phosphorus atoms.

15

15. (Currently amended) The ~~polymer~~ copolymer of Claim 14, wherein the heteroatom is oxygen, and the heteroatom substituted C₁-C₁₂ alkyl further comprises a hydroxyl group.

20

16. (Currently amended) The ~~polymer~~ copolymer of Claim 13, wherein the acid-containing or protected acid-containing group is derived from a carboxylic acid-containing monomer.

25

17. (Currently amended) The ~~polymer~~ copolymer of Claim 13, wherein the acid-containing or protected acid-containing group is derived from a monomer selected from the group consisting of tert-butyl acrylate; 2-methyl-2-adamantyl acrylate; 2-methyl-2-norbornyl acrylate and acrylic acid.

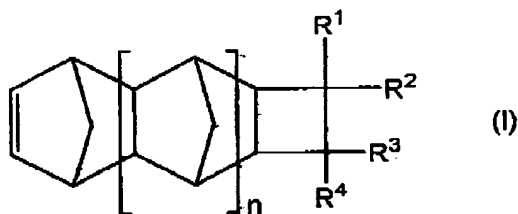
30

18. (Currently amended) The ~~polymer~~ copolymer of Claim 1, further comprising at least one group derived from a polar monomer.

19. (Currently amended) A photoresist composition comprising:

(1) a fluorine-containing polymer copolymer, wherein the fluorine-containing polymer copolymer comprises:

- 5 (a) at least one repeat unit derived from an ethylenically unsaturated compound having at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom; and
- 10 (b) at least one repeat unit derived from an ethylenically unsaturated compound having the structure:



wherein n is 0, 1, or 2;

15 R¹, R², R³ and R⁴ are independently H, OR⁵, halogen, alkyl or alkoxy of 1 to 10 carbon atoms, optionally substituted by halogen or ether oxygens, Y, C(R_f)(R_f')OR⁵, R⁶Y or OR⁶Y;

Y is COZ or SO₂Z;

R⁵ is hydrogen or an acid-labile protecting group;

20 R_f and R_f' are the same or different fluoroalkyl groups of 1 to 10 carbon atoms or taken together are (CF₂)_m where m is 2 to 10;

R⁶ is an alkylene group of 1 to 20 carbon atoms, optionally substituted by halogen or ether oxygen;

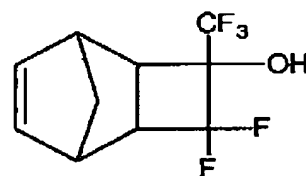
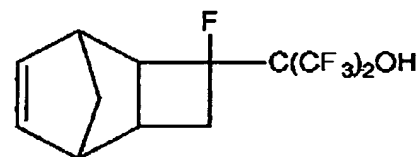
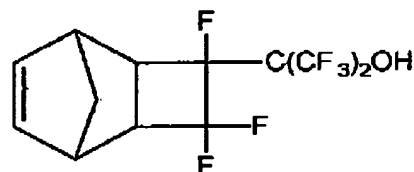
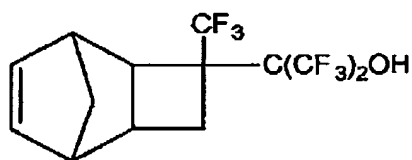
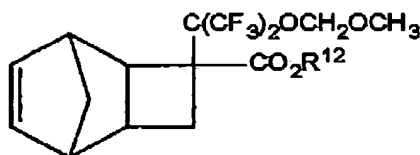
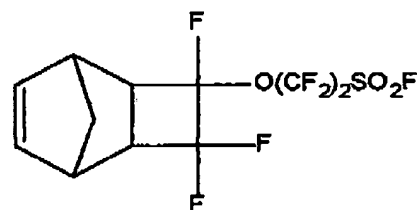
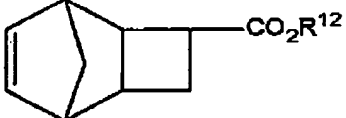
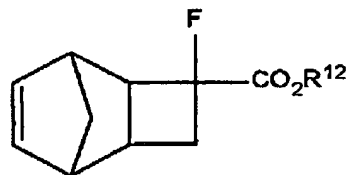
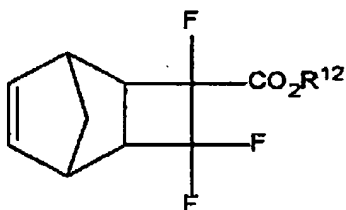
Z is OH, halogen, or OR⁷; and

25 R⁷ is an alkyl group of 1 to 20 carbon atoms, with the proviso that at least one of R¹, R², R³ and R⁴ is OR⁵, Y, C(R_f)(R_f')OR⁵, R⁶Y or OR⁶Y, and the proviso that if R¹ (or R³) is OH, R² (or R⁴) is not OH or halogen; and

(2) a photoactive component.

20. (Currently amended) The photoresist composition of Claim 19, wherein the monomer having structure (I) in the fluorine-containing polymer copolymer is selected from the group consisting of:

5



wherein R¹² is an alkyl group of 1 to 20 carbon atoms.

10

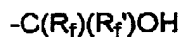
21. (Original) The photoresist composition of Claim 19, wherein (a) is a fluoroolefin comprising 2 to 20 carbon atoms.

22. (Original) The photoresist composition of Claim 21, wherein the
5 fluoroolefin is selected from the group consisting of tetrafluoroethylene; hexafluoropropylene; chlorotrifluoroethylene; vinylidene fluoride; vinyl fluoride; perfluoro-(2,2-dimethyl-1,3-dioxole); perfluoro-(2-methylene-4-methyl-1,3-dioxolane); $\text{CF}_2=\text{CFO}(\text{CF}_2)_t\text{CF}=\text{CF}_2$, wherein t is 1 or 2; and $\text{R}_f''\text{OCF}=\text{CF}_2$, wherein R_f'' is a saturated fluoroalkyl group of from 1 to 10
10 carbon atoms.

23. (Original) The photoresist composition of Claim 22, wherein the fluoroolefin is tetrafluoroethylene.

15 24. (Currently amended) The photoresist composition of Claim 19, wherein the fluorine-containing polymer copolymer further comprises a unit containing a fluoroalcohol group or a protected fluoroalcohol group.

25 25. (Original) The photoresist composition of Claim 24, wherein the fluoroalcohol group or the protected fluoroalcohol group is derived from at least one ethylenically unsaturated compound containing a fluoroalcohol group having the structure:



25 wherein R_f and R_f'' are the same or different fluoroalkyl groups of from 1 to 10 carbon atoms or taken together are $(\text{CF}_2)_m$ wherein m is 2 to 10.

30 26. (Original) The photoresist composition of Claim 25, wherein R_f and R_f'' are perfluoroalkyl groups.

27. (Currently amended) The photoresist composition of Claim 19, wherein the fluorine-containing polymer copolymer further comprises a fluoroalcohol group having the structure:

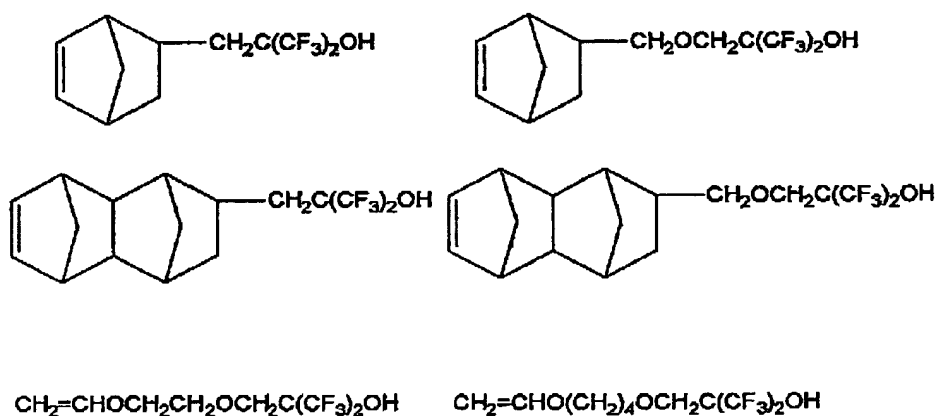


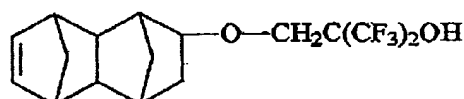
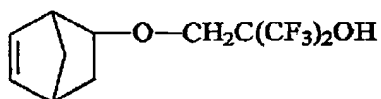
wherein R_f and R_f' are the same or different fluoroalkyl groups of from 1 to 10 carbon atoms or taken together are $(CF_2)_m$ wherein m is 2 to 10; and X is an element from Group VA and VIA of the Periodic Table of the
10 Elements.

28. (Original) The photoresist composition of Claim 27, wherein X is selected from the group consisting of oxygen, sulfur, nitrogen and phosphorous.
15

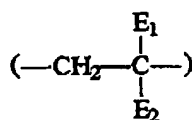
29. (Original) The photoresist composition of Claim 28, wherein X is oxygen.

30. (Original) The photoresist composition of Claim 25, wherein the
20 monomer containing the fluoroalcohol functional group or the protected fluoroalcohol group is selected from the group consisting of:





31. (Currently amended) The photoresist composition of Claim 19,
 5 wherein the fluorine-containing polymer copolymer further comprises at
 least one acid-containing or protected acid-containing group of structural
 unit:



10

wherein E₁ is H or C₁-C₁₂ alkyl; E₂ is CO₂E₃, SO₃E, or other acidic group;
 and E and E₃ are independently selected from the group of H,
 unsubstituted C₁-C₁₂ alkyl, and heteroatom substituted C₁-C₁₂ alkyl.

15

32. (Original) The photoresist composition of Claim 31, wherein the
 heteroatom is selected from the group consisting of oxygen, nitrogen,
 sulfur, halogen and phosphorus atoms.

20

33. (Original) The photoresist composition of Claim 32, wherein the
 heteroatom is oxygen, and the heteroatom substituted C₁-C₁₂ alkyl further
 comprises a hydroxyl group.

25

34. (Original) The photoresist composition of Claim 31, wherein the
 acid-containing or protected acid-containing group is a carboxylic acid-
 containing monomer.

35. (Original) The photoresist composition of Claim 34, wherein the
 acid-containing or protected acid-containing group is selected from the

group consisting of tert-butyl acrylate; 2-methyl-2-adamantyl acrylate; 2-methyl-2-norbornyl acrylate and acrylic acid.

36. (Currently amended) The photoresist composition of Claim 19,
5 wherein the fluorine-containing ~~polymer~~ copolymer further comprises at least one group derived from a polar monomer.

37. (Original) The photoresist composition of Claim 19, wherein the
10 photoactive component is a photoacid generator.

38. (Original) The photoresist composition of Claim 19, further
comprising a dissolution inhibitor.

39. (Original) The photoresist composition of Claim 19, further
15 comprising a solvent.

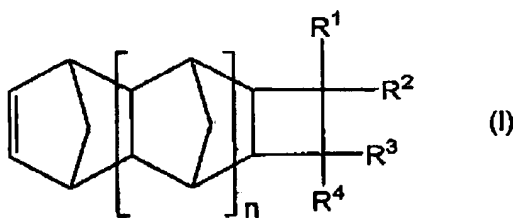
40. (Original) The photoresist composition of Claim 39, wherein the
solvent is selected from the group consisting of an ether ester; a ketone;
an ester, a glycol ether, a substituted hydrocarbon; an aromatic
20 hydrocarbon; a fluorinated solvent and super critical CO₂.

41. (Original) The photoresist composition of Claim 19, further
comprising at least one additive selected from the group consisting of
bases, surfactants, resolution enhancers, adhesion promoters, residue
25 reducers, coating aids, plasticizers, and T_g (glass transition temperature) modifiers.

42. (Currently amended) A coated substrate comprising:
(1) a substrate; and
30 (2) a photoresist composition comprising:
(a) a fluorine-containing ~~polymer~~ copolymer comprising a repeat unit derived from:

(i) at least one repeat unit derived from an ethylenically unsaturated compound having at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom; and

(ii) at least one repeat unit derived from an ethylenically unsaturated compound having the structure:



wherein n is 0, 1, or 2;

R¹, R², R³ and R⁴ are independently H, OR⁵, halogen, alkyl or alkoxy of 1 to 10 carbon atoms, optionally substituted by halogen or ether oxygens, Y, C(R_f)(R_f')OR⁵, R⁶Y or OR⁶Y;

Y is COZ or SO₂Z;

R⁵ is hydrogen or an acid-labile protecting group;

R_f and R_f' are the same or different fluoroalkyl groups of 1 to 10 carbon atoms or taken together are (CF₂)_m where m is 2 to 10;

R⁶ is an alkylene group of 1 to 20 carbon atoms, optionally substituted by halogen or ether oxygen;

Z is OH, halogen, or OR⁷; and

R⁷ is an alkyl group of 1 to 20 carbon atoms, with the proviso that at least one of R¹, R², R³ and R⁴ is Y, OR⁵, C(R_f)(R_f')OR⁵, R⁶Y or OR⁶Y, and the proviso that if R¹ (or R³) is OH, R² (or R⁴) is not OH or halogen;

and

(a) (b) a photoactive component.

43. (Original) The coated substrate of Claim 42, wherein the substrate is a microelectronic wafer.

44. (Original) The coated substrate of Claim 43, wherein the microelectronic wafer comprises a material selected from the group consisting of silicon, silicon oxide, silicon oxynitride, and silicon nitride.

5

45. (Original) A reaction product of quadracyclane and a fluoroalkylbenzoate compound.